DETERMINATION OF WATER RESOURCE CLASSES, RESERVE AND RQOS IN THE LIMPOPO (A5-A9) CATCHMENTS & OLIFANTS (B9) CATCHMENT

Public meeting – Makhado

Results for the Ecological Reserve, Water Resource Classes and the Resource Quality Objectives

Presented by: Karl Reinecke, Toriso Tlou, James MacKenzie and Martin Holland

Date: 5th August 2025

WATER IS LIFE - SANITATION IS DIGNITY

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

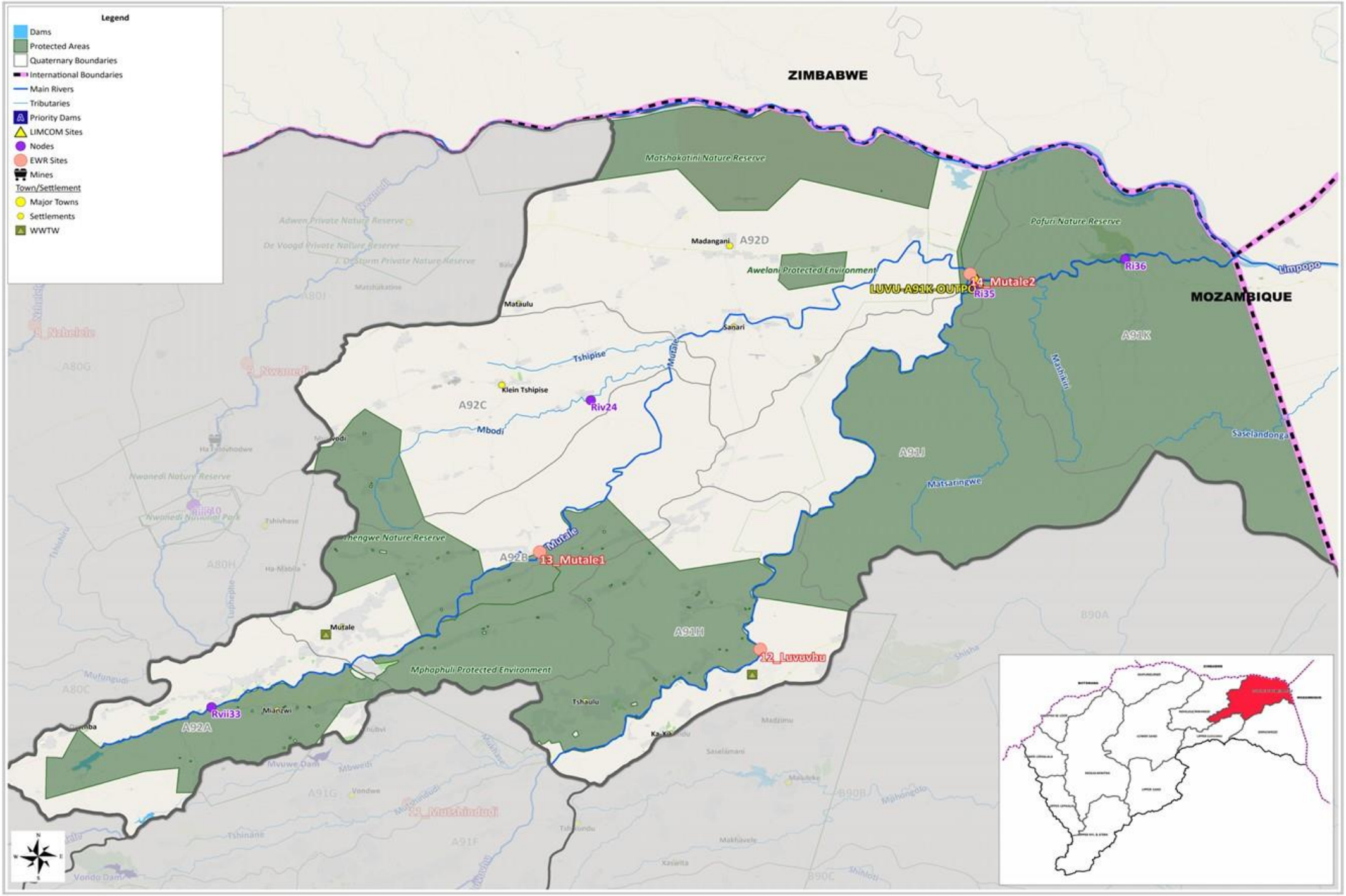
2030 NDP

30 YEARS OF FREEDOM
South Africa 1994 - 2024

OUTLINE – Lower Luvuvhu/Mutale IUA

1. Rivers – Karl Reinecke
2. Dams – Toriso Tlou
3. Wetlands – James MacKenzie
4. Groundwater – Martin Holland

LOWER LUVUVHU/ MUTALE IUA



Outcomes from the Ecological Reserve process

Component	Score	Ecological Category	REC
Water quality	85.5	B	B
Geomorphology	54.0	D	C/D
Vegetation	66.5	C	C
Macroinvertebrates	79.3	B/C	B/C
Fish	68.3	C	C
PES score	70.7		
PES category	C		
EIS	MODERATE		
REC	B/C		
Mitigation to achieve the REC	Management of sand mining and land use practices.		

nMAR	388.014 MCM	
S.Dev.	22.810	
CV	0.059	
Q75	0.905	
Ecological Category	C	
	MCM	% nMAR
Total EWR	151.920	39.153
Maint. Lowflows	114.146	29.418
Drought Lowflows	92.115	23.740
Maint. Highflows	37.773	9.735

Excludes floods with return period ≥1:2 years.

Monthly Distributions (MCM)

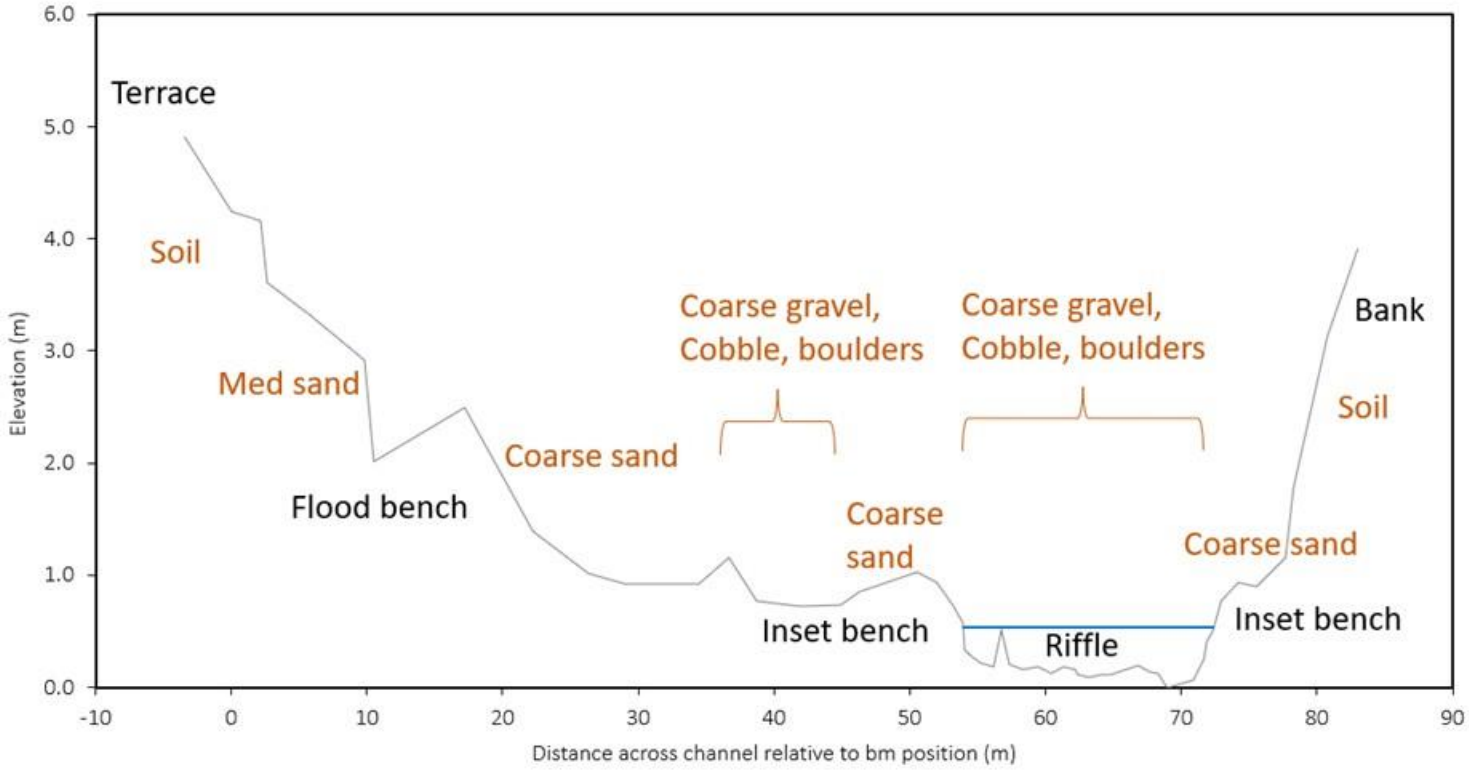
	Natural	Modified Flows (EWR)			
		Lowflows		Highflows	Total EWR
Month	Mean	Maint.	Drought	Maint.	Maint.
Oct	9.253	1.441	3.625	0.169	1.610
Nov	14.455	2.622	4.419	1.095	3.718
Dec	30.646	7.833	7.423	4.808	12.641
Jan	60.397	15.474	10.840	7.867	23.340
Feb	92.187	25.241	13.731	9.055	34.296
Mar	74.955	28.602	15.832	8.316	36.917
Apr	37.623	16.085	10.752	5.574	21.658
May	20.738	6.640	7.113	0.732	7.372
Jun	15.321	3.964	5.587	0.090	4.055
Jul	12.726	2.787	4.823	0.038	2.825
Aug	10.651	1.938	4.195	0.007	1.944
Sep	9.063	1.520	3.776	0.023	1.543
Total	388.01	114.15	92.12	0.169	151.92

Outcomes of the Classification scenario analysis

- Water Resource Class II
- WQ, sand mining, invasive exotic plants

Quat	Node	River	PES	REC	TEC	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Lower Luvuvhu/Mutale IUA																		
A91H	Ri32	Luvuvhu	C	B/C	C	1.98	4.575	11.723	34.637	71.668	59.208	24.057	9.565	5.336	3.703	2.832	2.18	231.468
A92A	Rvii33	Mutale	C		C	1.408	2.828	5.683	11.565	15.937	13.589	7.055	2.337	1.105	0.975	0.718	0.753	63.947
A92B	Ri33	Mutale	C	C	C	2.106	4.651	10.302	21.034	29.762	22.573	10.601	3.529	1.77	1.559	1.174	1.2	110.263
A92C	Riv24	Mbodi	D		D	0	0.108	0.538	0.951	1.81	0.812	0.1	0	0	0	0	0	4.31
A92D	Ri34	Mutale	C	C	C	2.324	5.714	13.407	27.108	39.584	27.51	11.757	4.024	2.075	1.811	1.387	1.387	138.092
A91J	Ri35	Luvuvhu	B		B	1.614	4.031	14.106	38.074	76.494	61.135	24.447	7.522	4.261	3.008	2.3	1.771	238.764
A91K	Ri36	Luvuvhu	C	C	C	3.927	9.735	29.276	69.196	122.877	93.28	37.941	11.417	6.322	4.81	3.679	3.151	395.616

RQOs for EWR site 12_Luvuvhu



Ecological Water Requirements (EWR) - site

nMAR	388.014 MCM	
S.Dev.	22.810	
CV	0.059	
Q75	0.905	
Ecological Category	C	
	MCM	% nMAR
Total EWR	151.920	39.153
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Total	388.01	114.15	92.12	0.169	151.92

RQOs – water quality

Sub-component	Indicator	RQO Narrative	RQO Numerical	TPC
Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95th percentile EC ≤ 55 mS/m	95th percentile Electrical conductivity greater than 44 mS/m
Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations should be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l	Median TIN greater than 1.40 mg/l
	Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.075 mg/l	Median PO_4-P greater than 0.060 mg/l
System variables	Dissolved oxygen	Dissolved oxygen concentrations should be such that some oxygen sensitive species are present in the river.	5th percentile Dissolved oxygen concentration ≥ 6 mg/l	Dissolved oxygen concentrations less than 7.2 mg/l
	pH	pH should be maintained in an Ideal category	6.5 ≤ pH ≤ 8.5	pH between 6.0 - 6.5 or pH between 8.5 - 9.0
	Water temperature	Water temperatures should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation	Water temperatures outside of the reference thermograph (95% band) plus or minus 1 standard deviation
Toxins	Ammonia (NH_3-N) Atrazine Endosulfan	Toxicity levels should not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95th percentile) Atrazine ≤ 49 µg/l (95th percentile) Endosulfan ≤ 0.075 µg/l (95th percentile)	95th percentile Ammonia (NH_3-N) greater than 35 µg/l 95th percentile Atrazine greater than 39 µg/l 95th percentile Endosulfan greater than 0.06 µg/l
Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)	95th percentile E coli / Faecal coliforms greater than 20 cfu/100ml

RQOs – geomorphology

Component	Sub-component	Indicator	RQO Narrative	RQO Numerical	TPC
Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle reach type.	Maintain a GAI PES score of at least a 'D' or > 42%	GAI PES score < 42%
		Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional survey	Riffle bed aggradation or degradation of more than 0.5 m from reference/longer-term average
		Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 40% of riverbank length	Active bank erosion of more than 40% of riverbank length
		Bed sediment size	Maintain dominant riffle sediment size to include gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 35 mm, D16 of 19 mm and D84 of 59 mm	Riffle dominated by sand or only cobble
		Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment	Embeddedness levels of > 25% for 25% of riffle area/sampling points
		Pool depth	Maintain upstream pool with deep open water	Maintain upstream pool with water > 0.5 m deep for > 60% of pool area	Upstream pool is > 60% filled with sediment and forming largely shallow habitat
		Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 5 m wide along at least one bank with signs of recent fine sediment deposition	Channel erosion to the extent where there are no benches wider than ~ 5 m and no signs of recent fine sediment deposition on the benches

RQOs – riparian vegetation

Component	Sub-component	Indicator	RQO Narrative	RQO Numerical	TPC
Riparian vegetation	Marginal zone	Dominant vegetation	Non-woody vegetation should dominate the marginal zone	Non-woody cover >= 60% (aerial cover).	Non-woody cover less than 60%
		Key species	*Phragmites mauritianus* , Breonadia *salicina* and *Ficus caprefolia* must be present.	3 listed species present.	Absence of 1 or more listed key species
		Alien plant species	The riparian vegetation structure and composition in the marginal zone should maintain desired dominance and non-dominance.	No perennial alien plant species.	Presence of perennial alien plants
		Terrestrial woody cover		No terrestrial woody plants.	Presence of terrestrial woody species
		Indigenous woody cover		Woody cover <= 25% (aerial cover).	Woody cover more than 25%
		Non-woody cover		Non-woody cover >= 60% (aerial cover).	Non-woody cover less than 60%
		Reed cover		Reed cover <= 65% (aerial cover).	Cover by reeds more than 65%
	Non-marginal (lower - flood benches)	Dominant vegetation	Woody and non-woody vegetation should co-dominate the flood features	A mix of woody and non-woody plants.	Non-woody cover less than 15% or woody cover less than 5%
		Key species	*Phragmites mauritianus*, *Ludwigia octovalvis*, *Pluchea dioscoridis*, *Phyllanthus reticulatus*, *Flueggea virosa*, *Ficus sycomorus* and *Combretum erythrophyllum* must be present.	7 listed species present.	Absence of 1 or more listed key species
		Alien plant species	The riparian vegetation structure and composition on the flood features should maintain desired dominance and non-dominance.	Perennial alien plant species <= 10% (aerial cover).	Cover by perennial alien plants more than 10%
		Terrestrial woody cover		Terrestrial woody cover <= 10% (aerial cover).	Cover by terrestrial woody species more than 10%
		Indigenous woody cover		Woody cover <= 15% (aerial cover).	Woody cover more than 15%
		Non-woody cover		Non-woody cover >= 15% (aerial cover).	Non-woody cover less than 15%
	Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation should dominate the macro-channel banks	Woody cover >= 60% (aerial cover).	Woody cover less than 60%
		Alien plant species	Alien invasive plant species should be kept low or absent on macro-channel banks	Perennial alien plant species <= 10% (aerial cover).	Cover by perennial alien plants more than 10%
	Riparian zone	PES	The PES category should be a C at least	VEGRAI score >= 62%	VEGRAI score < 62%
		Species richness	Indigenous plant species richness in the riparian zone should be maintained.	>= 35 indigenous species.	Less than 35 indigenous plant species present
		Endemic riparian species	*Combretum erythrophyllum* (southern African endemic) must be present.	1 listed species present.	Absence of 1 or more listed endemic species
		Threatened riparian species	2 nationally protected tree species: Apple Leaf (*Philenoptera violacea*) and Matumi (*Breonadia salicina*) must be present.	2 listed species present.	Absence of 1 or more listed protected species

RQOs – macroinvertebrates

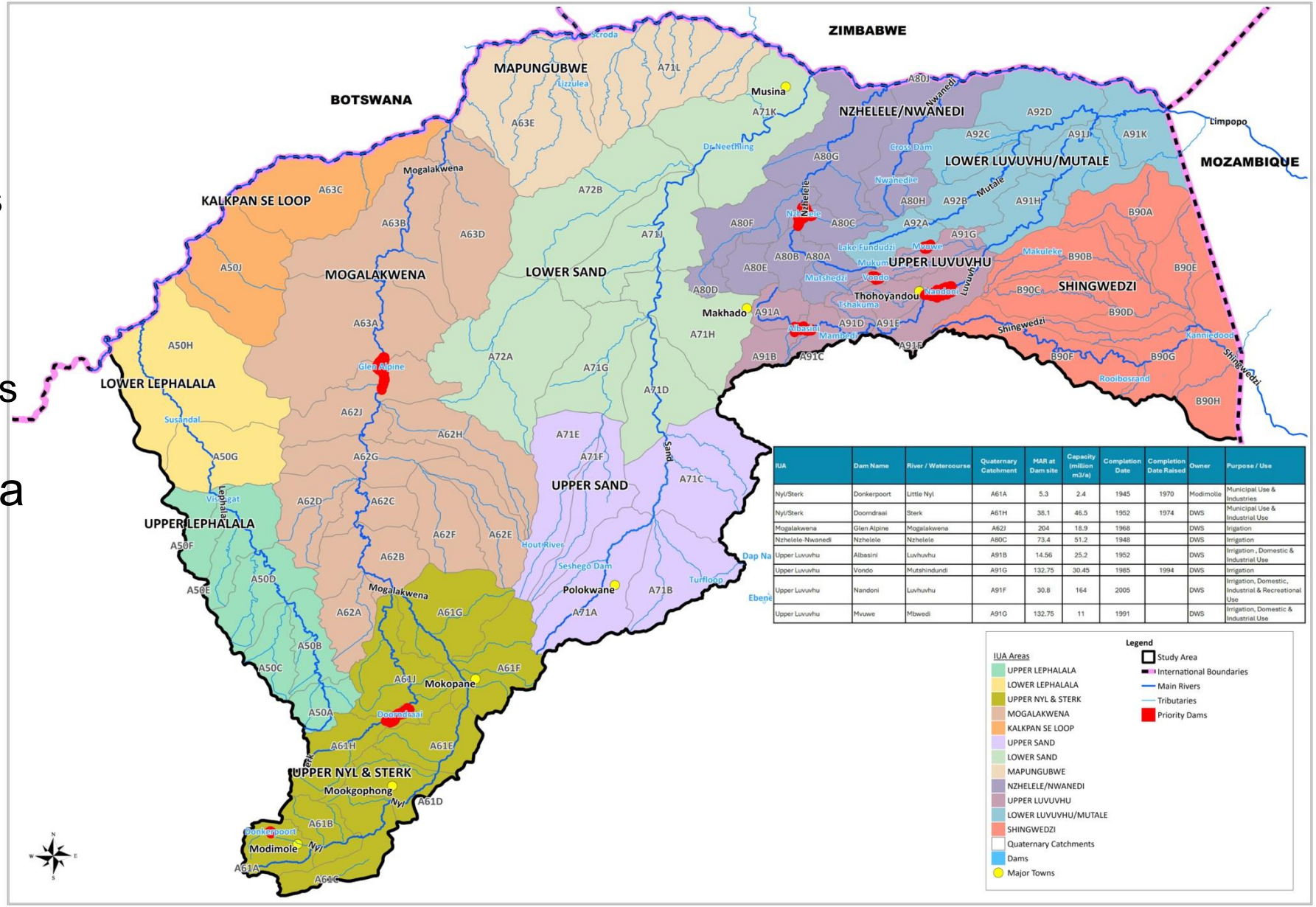
Component	Sub-component	Indicator	RQO Narrative	RQO Numerical	TPC
Biota	Fish	FRAI score	The Ecological Category should be maintained within a B/C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a C category (>62%)	A FRAI score that calculates to a PES category less than C for two or more consecutive surveys
		Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population	Bacterial infections and/or parasitic burdens impacting >1% of the fish population during any survey
		Species diversity	To maintain suitable habitat conditions that would support the key species.	Maintain the diversity of species as per EWR studies	Loss of species diversity that results in a drop in PES category
		Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records.	The absence of any of the target species for two or more consecutive surveys
				Relative abundance of species:	
				Labeobarbus marequensis (2), Labeo cylindricus (2), Anoplopterus "southern stargazer sp" (1) , Anguilla marmorata (1), Glossogobius callidus (1), Chiloglanis pretoriae (2), Enteromius trimaculatus (1)	

RQOs – fish

Component	Sub-component	Indicator	RQO Narrative	RQO Numerical	TPC
Biota	Macroinvertebrates	MIRAI Category and Score	The Ecological Category should remain within a C Category.	To ensure that the MIRAI score remains within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.	A MIRAI score of 64% or less.
		SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 score and ASPT values are in the following range: SASS5 score: >170; ASPT value: >6.1.	SASS5 scores less than 175 and ASPT less than 6.2.
		Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Perlidae Simuliidae	Minimum abundance of an A attained for both Perlidae and Simuliidae.	If Perlidae or Simuliidae is missing in two consecutive surveys or has a single individual present in two consecutive surveys.
			To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Atyidae	Minimum abundance of an A attained.	Atyidae missing in two consecutive surveys or has a single individual present in two consecutive surveys.
			To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae	Minimum abundance of an A attained.	Gomphidae missing in two consecutive surveys or has a single individual present in two consecutive surveys.

PRIORITISATION OF DAMS

- Dams selection criteria
  - Water use sectors dependent on the dams
  - Impact of upstream use on inflows
  - Importance to downstream water users
  - Water quality
- Dams are operated as a system – 3 main systems
  - Mogalakwena
  - Nzhelele/Nwanedi
  - Luvuvhu system
-



IUA	Dam Name	River / Watercourse	Quaternary Catchment	MAR at Dam site	Capacity (million m3/a)	Completion Date	Completion Date Raised	Owner	Purpose / Use
Nyl/Sterk	Donkerpoort	Little Nyl	A61A	5.3	2.4	1945	1970	Modimolle	Municipal Use & Industries
Nyl/Sterk	Doorndraai	Sterk	A61H	38.1	46.5	1952	1974	DWS	Municipal Use & Industrial Use
Mogalakwena	Glen Alpine	Mogalakwena	A62J	204	18.9	1968		DWS	Irrigation
Nzhelele-Nwanedi	Nzhelele	Nzhelele	A80C	73.4	51.2	1948		DWS	Irrigation
Upper Luvuvhu	Albasini	Luvhuvhu	A91B	14.56	25.2	1952		DWS	Irrigation , Domestic & Industrial Use
Upper Luvuvhu	Vondo	Mutshindundi	A91G	132.75	30.45	1985	1994	DWS	Irrigation
Upper Luvuvhu	Nandoni	Luvhuvhu	A91F	30.8	164	2005		DWS	Irrigation, Domestic, Industrial & Recreational Use
Upper Luvuvhu	Mvuwe	Mbwedi	A91G	132.75	11	1991		DWS	Irrigation, Domestic & Industrial Use

RQOS FOR DAMS – WATER QUANTITY

- Water Quantity / availability and requirements
  - Determined by undertaking an Annual Operating Analysis of the system provided by the dam
  - AOA determines the amount of water that can be
    - released for the EWR to meet the base flows
    - supplied sustainably & equitably to the water use sector dependent over the coming hydrological year being considered
  - Water Restrictions
    - Where the water available to carry over to the next hydrological cycle
    - Restrictions will be implemented based on priority classification approved at the system operating forum
- Directorate: System Analysis
  - Responsible for determining the releases required in each hydrological year depending on the starting storage level of each dam
  - Monthly monitoring of projected releases for the EWR

RQOS FOR LUVUVHU SYSTEM– WATER QUANTITY

Objective	Task ID	Task	Description of Task	Unit of Measure	Data Source
Maintain theDam storage capacity to meet the releases to meet Base Flows	1	**Starting Storages at beginning of hydrological year (1 April)**	Establish the starting storage of the dam level	% of storage capacity	Use of SAWS data and SARCOF for weather outlook prediction & application
	2	**Short term Characteristic Curve of Dam**	Determine the short-term characteristic curves (STCCs) -	Volume of water available at different assurance levels for a given starting period	Water Resource Yield Model
	3	**User priority classification of the dam incl. EWR releases**	Review and Update the User categories for each system to include the EWR & International Obligations	Priority classification table	Annual Operating Analysis
	4	**Curtailment Curve**	Apply the STCCs to the starting storage to determine the water allocations that can be supplied to each user sector with EWR a priority user	Graphical plot of starting storage level vs factor of water allocation to be supplied for the hydrological year	Hydrological Drought Analysis Model (HDAM)
	5	**Stakeholder Participations**	Engage with the System Operating Forum (SOF) on the proposed releases for the hydrological year (including releases for the EWR)	Avoid dam storage level going down below the percentage to carryover to the next hydrological cycle. Review at 1 Nov- projected runoff	N/A

RQOS FOR LUVUVHU SYSTEM– RQOs for Quantity

	10	20	30	40	50	60	70	80	90	99
Oct	2.434	2.074	1.749	1.484	1.253	1.158	1.076	1.012	0.958	0.937
Nov	2.302	1.973	1.647	1.391	1.228	1.114	1.032	0.971	0.927	0.898
Dec	2.409	2.124	1.824	1.541	1.3	1.169	1.071	0.969	0.968	0.966
Jan	3.934	2.61	2.147	1.641	1.367	1.204	1.109	1.026	0.97	0.938
Feb	6.281	2.762	2.021	1.594	1.288	1.108	1.008	0.938	0.893	0.859
Mar	5.508	3.76	2.473	1.835	1.463	1.241	1.119	1.042	0.991	0.96
Apr	4.569	3.312	2.595	1.857	1.512	1.303	1.135	1.028	1.018	0.972
May	4.663	3.418	2.738	2.015	1.629	1.376	1.236	1.071	1.012	0.991
Jun	4.16	3.215	2.592	1.981	1.542	1.221	1.201	1.032	0.99	0.947
Jul	3.785	3.09	2.565	1.923	1.506	1.253	1.168	1.043	1.036	0.98
Aug	3.323	2.842	2.388	1.797	1.429	1.231	1.117	1.039	0.992	0.977
Sep	2.711	2.316	1.924	1.569	1.293	1.155	1.064	0.996	0.951	0.921
Total	**46.079**	**33.496**	**26.663**	**20.628**	**16.81**	**14.533**	**13.336**	**12.167**	**11.706**	**11.346**

EWR Monthly Rule curve – Albasini Dam

EWR Monthly Rule curve EWR site Ri27 – Vondo Dam

nMAR	56.42	MCM				
S.Dev.	3.444					
CV	0.061					
Q75	0.135					
Ecological Category	C					
	MCM	% MAR				
Total EWR	40.811	72.335				
Maint. Lowflows	24.108	42.73	Excludes floods with return period ≥1:2 years.			
Drought Lowflows	11.736	20.802				
Maint. Highflows	16.703	29.605				

Monthly Distributions (MCM)

	Natural	Modified Flows (EWR)			
		Low flows		High Flows	Total EWR
Month	Mean	Maint.	Drought	Maint.	Maint.
Oct	1.154	0.664	0.421	0.078	0.742
Nov	2.528	0.967	0.688	0.436	1.403
Dec	6.135	2.094	1.267	1.827	3.921
Jan	9.959	3.638	1.847	3.433	7.07
Feb	13.104	4.14	1.803	4.931	9.071
Mar	10.55	4.494	1.897	3.825	8.32
Apr	5.171	2.662	1.178	1.711	4.373
May	2.593	1.633	0.776	0.324	1.958
Jun	1.707	1.213	0.569	0.082	1.295
Jul	1.374	1.035	0.491	0.015	1.05
Aug	1.125	0.853	0.413	0.016	0.87
Sep	1.02	0.714	0.387	0.025	0.739
Total	56.42	24.11	11.74	16.7	40.81

RQOS FOR LUVUVHU SYSTEM– RQOs Quantity

	Natural	Modified Flows (EWR)				
		Lowflows		Highflows		Total EWR
Month	Mean	Maint.	Drought	Maint.		Maint.
Oct	9.253	1.441	3.625	0.169		1.61
Nov	14.455	2.622	4.419	1.095		3.718
Dec	30.646	7.833	7.423	4.808		12.641
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Jul	12.726	2.787	4.823	0.038		2.825
Aug	10.651	1.938	4.195	0.007		1.944
Sep	9.063	1.52	3.776	0.023		1.543
Total	388.01	114.15	92.12	37.77		151.92

EWR Monthly Rule curve – EWR Site Ri32

EWR Monthly Rule curve – Nandoni Dam

Monthly Distributions (MCM)						
	Natural	Modified Flows (EWR)				
		Low flows		High flows	Total EWR	
Month	Mean	Maint.	Drought	Maint.	Maint.	
Oct	8.099	0.777	3.204	0.091	0.868	
Nov	11.927	1.655	3.731	0.659	2.314	
Dec	24.511	5.739	6.156	2.981	8.72	
Jan	50.438	11.836	8.993	4.434	16.27	
Feb	79.083	21.101	11.928	4.124	25.225	
Mar	64.405	24.108	13.935	4.491	28.599	
Apr	32.452	13.423	9.574	3.863	17.286	
May	18.145	5.007	6.337	0.408	5.415	
Jun	13.614	2.751	5.018	0.008	2.759	
Jul	11.352	1.752	4.332	0.023	1.775	
Aug	9.526	1.085	3.782	-0.009	1.076	
Sep	8.043	0.806	3.389	-0.002	0.804	
Total	**331.595**	**90.04**	**80.379**	**21.071**	**111.111**	**0**

RQOS FOR LUVUVHU SYSTEM– QUANTITY

- Starting storage – more than the annual requirements for the hydrological year
- Relative wet year EWR taken to represent 80% exceedance probability
- STCC indicate that no curtailment required – if irrigation is not supplied
- As the developments dependent on Nandoni Dam take place the EWR will not be sustained as it is considered high
- Realised EWR monthly rule curve required downstream of Nandoni Dam

Nandoni Dam – RQOs for quality

Component	Sub-component	Indicator/ Measure	RQO Narrative	RQO Numerical	TPC
Quality	Nutrients	Total Phosphates (mg/l)	Maintain Nandoni Dam in a mesotrophic state or better (intermediate levels of nutrients, fairly productive in terms of aquatic animal and plant life and showing emerging signs of water quality problems) in order to protect irrigation water supply to downstream users and rural domestic water users.	Median annual Total Phosphates ≤ 0.047 mg/l	Median annual Total Phosphates greater than 0.038 mg/l
		Chlorophyll a (µg/l)		Median annual Chlorophyll a ≤ 20 µg/l	Median annual Chlorophyll a greater than 16 µg/l
	Salts	Electrical Conductivity (EC) (mS/m)	Salt concentrations must be maintained at a level that is not harmful to aquatic ecosystems in the dam and is in an Acceptable fitness for use state for domestic and industrial water supply, and for irrigation water supply.	95%tile EC ≤ 90 mS/m	95%tile EC greater than 72 mS/m
		Total dissolved salts (TDS) (mg/l)		95%tile TDS ≤ 585 mg/l	95%tile TDS greater than 468 mg/l
	Pathogens	Escherichia coli, Faecal coliforms	Nandoni Dam must be maintained in an Acceptable microbiological state that is safe for contact recreational user.	95%tile E coli / Faecal coliforms ≤ 25 cfu/100ml	95%tile E coli / Faecal coliforms greater than 20 cfu/100ml

Nandoni Dam – RQOs for biota

Component	Sub-componen	Indicator/ Measure	RQO Narrative	RQO Numerical	TPC
Biota	Fish	Maintenanc e of fish species diversity	Maintain fish abundance at a level that fulfils ecosystem services roles of recreational angling and subsistence harvesting	Balanced relative abundance and diversity between Cichlidae, Cyprinidae and Clariidae	A notable dominance of one family of fish over two or more consecutive assessments
		Fish health	Fish health to be maintained in a state that is safe for consumption and suitable for recreational angling	Ulcers, bacterial infections and parasite burdens limited to <1% of fish population	>1% of the catch being impacted by bacterial infections or overburden of parasites
		Fish abundance	Maintaining fish abundance to support subsistence and recreational fishing	Maintain a stable catch per unit effort relative to previous surveys	A notable decline in fish population abundance over more than two assessments
	Alien aquatic	Water Quality (Nutrients)	Maintain Nandoni Dam in a mesotrophic state or better	Median annual Total Phosphates ≤ 0.047 mg/l	Median annual Total Phosphates greater than 0.038 mg/l
				Median annual Chlorophyll a ≤ 20 µg/l	Median annual Chlorophyll a greater than 16 µg/l
		Aerial extent	Maintain low % aerial cover of AIP (Water Hyacinth, Water Lettuce, Water Fern, Kariba Weed, Parrot's Feather) on dam surface and fringe	Maintain aerial cover of AIP on dam surface below 10%	The presence of AIP species on the dam surface or along the fringe